IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Art Unit 1791	:	
In re application of	:	LIQUID CRYSTAL SEALING AGENT COMPOSITION AND MANUFACTURING METHOD OF LIQUID CRYSTAL DISPLASY PANEL USING THE SAME
Takashi MIYAWAKI et al.	:	
Serial No. 10/528,196	:	
Filed March 17, 2005	:	
Examiner Emily Ann CHIMIAK	:	

DECLARATION UNDER 37 CFR § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Yasushi MIZUTA, hereby declare as follows:

That I was graduated from Tohoku University, Department of Applied Chemistry. In March 1993, I received a degree of Doctor in Department of Applied Chemistry in Tohoku University.

Since April 1993, I have been an employee of Mitsui Chemicals, Inc. In the year of 2001, I had been assigned to Sodegaura Laboratory. Since August 2004, I have been engaged in research work concerning development of a Sealing material for LCD.

That I am one of the named inventors of the invention described and claimed in the above-identified patent application.

That I have read and am familiar with the above-identified patent application and the references cited by the Examiner, i.e., JP 05-295087 to Kunihiro et al., U.S. Patent No. 4,778,851 to Henton et al., U.S. Pub. No. 2007/0122742 A1 to Kato et al. and JP 63-179323 to Nobumasa et al.

That I carried out the following Experiment to be able to fully understand the present invention by the Examiner and believe it to be valuable.

REPORT OF EXPERIMENT

Synthesis Example 5

Synthesis of other thermoplastic polymer

A 1000-ml four-necked flask equipped with a stirrer, a nitrogen inlet tube, a thermometer and a reflux condenser tube was charged with 400 g of ion-exchange water and 1.0 g of sodium alkyldiphenyletherdisulfonate, followed by heating to 65°C. After addition of 0.4 g of potassium persulfate, a mixed solution emulsified with a homogenizer was added dropwise over a period of 4 hours, which mixed solution consisted of 1.2 g of t-dodecylmercaptane, 117 g of n-butyl acrylate, 4.0 g of divinylbenzene, 3.0 g of sodium alkyldiphenyletherdisulfonate, and 200 g of ion-exchange water. Reaction was continuously carried out for 2 hours after the dropwise addition. Thereafter, 271 g of methyl methacrylate was added all at once, and reaction was continuously performed for 1 hour. Subsequently, 8 g of acrylic acid was continuously added over a period of 1 hour, and reaction was carried out for 2 hours at a constant temperature of 65°C, followed by cooling. The pH was neutralized to 7 using potassium hydroxide, and an emulsion solution with a solid content of 40.7% by weight was obtained. 1000 g of the emulsion solution was dried with a spray dryer to give approximately 400 g of high softening temperature particles with a moisture content of not more than 0.1%. The softening temperature of the particles was 105°C. Particle diameter measurement of the high softening temperature particles with N-4-Coulter counter resulted in an average particle diameter of 150 nm.

Synthesis Example 6

Synthesis of other thermoplastic polymer

A 1000-ml four-necked flask equipped with a stirrer, a nitrogen inlet tube, a thermometer and a reflux condenser tube was charged with 400 g of ion-exchange water and 1.0 g of sodium alkyldiphenyletherdisulfonate, followed by heating to 65°C. After addition of 0.4 g of potassium persulfate, a mixed solution emulsified with a homogenizer was added dropwise over a period of 4 hours, which mixed solution consisted of 1.2 g of t-dodecylmercaptane, 78 g of n-butyl acrylate, 4.0 g of divinylbenzene, 3.0 g of sodium alkyldiphenyletherdisulfonate, and 200 g of ion-exchange water. Reaction was continuously carried out for 2 hours after the dropwise addition. Thereafter, 310 g of methyl methacrylate was added all at once, and reaction was continuously performed for 1 hour. Subsequently, 8 g of acrylic acid was continuously added over a period of 1 hour, and reaction was carried out for 2 hours at a constant temperature of 65°C, followed by cooling. The pH was neutralized to 7 using potassium hydroxide, and an emulsion solution with a solid content of 40.5% by weight was obtained. 1000 g of the emulsion solution was dried with a spray dryer to give approximately 400 g of high softening temperature particles with a moisture content of not more than 0.1%. The softening temperature of the particles was 122°C. Particle diameter measurement of the obtained particles with N-4-Coulter counter resulted in an average particle diameter of 160 nm.

Example 5 and Comparative Example 4

Liquid crystal sealing agent compositions P5 and C4 were produced in the same manner as in Example 1 according to the formulation given in Table 1. Evaluations were carried out by the methods described in Example 1. The results are shown in Table 2.

Table 1

Composition		Example					Comparative Example			
		P1	P2	P3	P4	P5	C1	C2	C3	C4
(1) Epoxy resin	Solid epoxy resin EOCN-1020-75	15	15	20	15	15		15	15	15
	Other epoxy resin EPICLON 830S						15			
(2) Acrylate monomer and/or methacrylate monomer, or oligomer thereof	BISCOAT 300	20		20	20	20	20	20	20	20
	BISCOAT 400		20							
(3) Thermoplastic polymer	Synthesis Example 1	15	15	15	15		15			
	Synthesis Example 2								15	
	Synthesis Example 5					15				
	Synthesis Example 6									15
(4) Light-activated radical polymerization initiator	IRGACURE 184	2	2	2	2	2	2	2	2	2
(5) Latent epoxy curing agent	AMICURE VDH-J	6	6	6	6	6	6	6	6	6
	CUREZOL 2E4 MZ-A	1	1	1	1	1	1	1	1	1
(6) Partially esterified epoxy resin	Synthesis Example 3	20	20	10		20	20	20	20	20
	Synthesis Example 4				20					
(7) Filler	SO-E1	20	20	20	20	20	20	35	20	20
Additive	KBM-403	1	1	1	1	1	1	1	1	1
Ratio of constituent (1) relative to 100 parts by weight of constituent (2)		75	75	75	75	75	0	75	75	75

Table 2

Test results of liquid crystal sealing agent composition

Test item Example	EX. 1	EX. 2	EX. 3	EX. 4	EX. 5	Comp. EX. 1	Comp. EX. 2	Comp. EX. 3	Comp. EX. 4
Liquid crystal sealing agent composition	P1	P2	P3	P4	P5	C1	C2	C3	C4
Viscosity stability	A	A	A	A	A	A	A	C	A
Glass transition temperature of light cured product (℃)	86	88	86	83	89	55	59	—	92
Gel fraction of heat cured product (%)	82	88	86	83	84	78	55	—	91
Cell gap size stability test	A	A	A	A	A	B	B	—	A
Bonding strength after light curing (MPa)	5.1	3.1	4.0	4.2	4.9	4.8	0.1	—	3.2
Bonding strength after light and heat curing (MPa)	20.2	17.5	19.0	17.8	19.0	16.0	1.2	—	15.0
Display characteristics test of liquid crystal display panel	A	A	A	A	A	B	C	—	A
Display characteristics test of shaded area of liquid crystal display panel	A	A	A	A	A	B	C	—	B

That the undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed

to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patents issuing thereon.

Date March 27, 2008 Inventor Yasushi Migita
[Name of Inventor]